

8 | Wayfinding and Parking Guidance

An important aspect of any parking system is the way in which the public is informed of parking facility locations, space availability, time restrictions, parking rates, and other related aspects of the system. This information is often delivered through maps developed and distributed by a variety of sources, including garage and parking lot signage, wayfinding signage and various agency websites. In addition, the evolution of technology has established an environment where real-time information is essential to the traveling public. Motorists now rely more than ever on the internet, devices such as smart-phones and in-vehicle navigation, and en-route real-time displays for finding their destination and the closest parking space. This chapter explains the current methods used for dissemination of parking information, discusses industry best practices, and provides recommendations specifically tailored to the Durham system.

Existing Information and Signing Program

There are a number of ways for motorists to obtain travel and parking information in Downtown Durham. Final destination points such as the Durham Bulls Athletic Park (DBAP), the Durham Performing Arts Center (DPAC), restaurants, City Hall, and others may provide directions and parking information on their respective web-sites. Motorists also depend on online mapping services for routing directions and the existing wayfinding and signing program in downtown Durham to lead them to their desired destination. Ensuring that each of the information sources provides accurate and consistent information will affirm confidence in downtown visitors.

Downtowndurham.com provides a variety of information about Downtown Durham, including mapping that divides downtown Durham into districts to support branding and wayfinding. There are seven districts – American Tobacco District, Brightleaf District, Central Park District, City Center District, Golden Belt District, Government Services District, and Warehouse District. These districts also are found on the Wayfinding signage in downtown. As shown in the photo to the right, wayfinding signage associates varying downtown districts with a distinct color.

While district and destination wayfinding in Durham is relatively consistent, there is room for improvement to provide a more navigable Downtown. An array of directional and destination signage is currently being used throughout the City; however, the signage is predominantly pedestrian in nature. Pedestrian level signage typically utilizes smaller text and graphics aimed at navigating Downtown visitors who are on foot. Conversely, vehicular level signage uses larger text and graphics for drivers moving at higher speeds than those on foot. Figure 8.1 provides a snapshot of the variability in parking signage throughout the Downtown study area.





Figure 8.1 – Typical Signage in the City of Durham

Methods for Improvement

Branding and Information Campaigns

The existing signing program in downtown Durham lays the groundwork for expansion. Maps displaying the color coded Districts are accessible from the City's webpage as well as from a Google® search of downtown Durham parking. These maps display visual locations and addresses of parking, shopping, and restaurants in each District.

The signing program expands on this by using color coded signing for destinations and Districts. The cities of Charlotte and Atlanta both use district or zone color distinction similar to Durham. Figure 8.2 and Figure 8.3 depict each city's pedestrian and vehicular wayfinding signs. Charlotte's system also incorporates a dynamic element for communicating parking information that allows the City the ability to modify directional signage should there be the need to provide alternate routing throughout Downtown to minimize congestion. Dynamic signage also allows the owner the ability to communicate street closings, events, or other useful information. With each of these programs, consistency in graphics and message is crucial to success.



Figure 8.2 – City of Charlotte Branding Campaign



Figure 8.3 – City of Atlanta Branding Campaign

With the framework in place for consistent signing, getting the message out to the public is the next step. An information or ad campaign on how the districts are divided and why is helpful for people to understand the districts in which they eat, drink, work, and play. One option, as seen on Charlotte's pedestrian signs, is to reinforce the district coloring by providing an overall map on the sign pole. Displaying the city color coded map, creating map pamphlets, and posting it on websites. Any opportunity to reinforce the color branding will aid in making people aware of how to use the wayfinding program most effectively.

Parking Guidance

Providing drivers advance information about their destination offers a sense of security and confidence for drivers as they navigate both familiar and unfamiliar territory. Providing this information in real-time is increasingly becoming the expectation. While attractions are the end destination for most people, from a driver's perspective the destination is parking. Real-time parking information and guidance will reduce the number of vehicles circulating for available parking, making the City less congested and safer from both a motorist and pedestrian perspective.

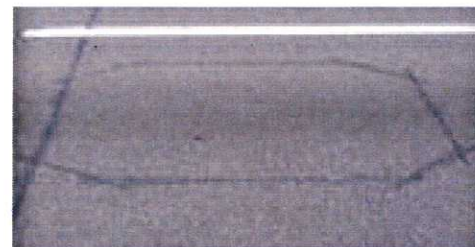
There are various means of providing parking availability information, from typical static signing, dynamic signing, websites, and mobile applications, each of which sets out to achieve the same goals:

- Reduce time spent searching for parking
- Reduce circulation searching for parking thereby providing a safer environment for other drivers and pedestrians
- Reduce fuel consumed searching for parking

Many of these types of systems have been deployed in large parking facilities with multiple levels (at airports, for example), where there would be a sign at the facility entrance displaying available parking on each level. In a downtown area, the parking is more likely to be spread over several blocks rather than located within one facility. Therefore, the point where information is conveyed is not necessarily the entrance. Drivers need information far enough in advance to make decisions about which direction has available parking. These types of parking guidance systems are very popular in European countries and have recently been gaining popularity in the U.S.

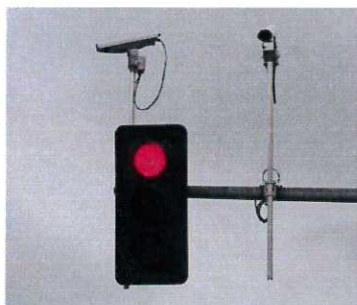
System Inputs

There are a number of operational and design considerations to take into account to ensure the implementation of the most effective guidance system. The first question to consider is, "what facilities will participate in the program?" It is expected that facilities willing and able to provide electronic, real-time, parking availability would be the most likely candidates. Having automated data from a reliable system or device will eliminate the opportunity of human error. When it comes to data collection from a facility and transfer to signage, there are a number of technological approaches possible. Installing inductive loops at facility entrances and exits to monitor vehicles entering and exiting is one possible approach.



In-Pavement Loops

Video detection also is a means of achieving the same goal, although the presence of pedestrians and extreme weather conditions may cause false reporting. Additionally, a revenue control system also can be used to accurately report space occupancy.



Video Detection



Revenue Control System

The way each parking facility handles special events parking needs will present a challenge when using any of these technologies, as loading and unloading a full facility at the beginning and end of an event are not typical, every-day operations. Mass loading and unloading of a facility is something that should be appropriately planned for at each facility taking into account the surrounding street network, number of entry/exit locations and lanes, and internal vehicular movements and ramping schemes. Despite these challenges, an experienced parking facility operator and the appropriate parking access control equipment will allow more effective event operations.

Each of these approaches to data collection for automated parking guidance signage has benefits and drawbacks. Table 8.1 lists a few of the pros and cons for each approach.

Table 8.1 – Vehicle Detection Options

Technology	Pros	Cons
Inductive Loops	Automatic, no manual input required	Installation
Ultrasonic Directional Sensors	Automatic, no manual input required. Low Cost. Can use wireless communications.	Installation
Video Detection	Automatic, no manual input required	Less reliable in inclement weather Presence of pedestrians may cause false reporting
Revenue Control System	Automatic, no manual input required	May not be operational during special events
Self-reporting	Gives operator the option of temporarily closing facility to public	Requires continuous manual input

Should the City move forward with a parking guidance system that incorporates any or all of these technologies, it is recommended that technical requirements be established for the transfer of data from facilities to the control center. These requirements would help to ensure the accuracy and interval of the data submitted. Depending on how a facility operates under special event conditions may dictate the need for the system to have an override option during such times.

System Connections

There are several prevalent forms of communication systems between field devices and an operations center that dictate how data from a parking facility is transferred. These media include fiber optic cable, wireless technology, and purchased services options. Key determinants in the selection of a communications medium are the requirements for the solution. Typically, dynamic message sign units are considered to have low bandwidth needs. On a continuous basis, they send and receive status poll data indicating the health of the sign. When

posting a message to a sign, there is a “burst” in message size, but even with this burst, it is still considered to be a low bandwidth application. The following is a brief description of media that are appropriate for this application.

- Fiber Optic Cable

Optical fiber has become the standard wireline communication medium for most new outdoor plant communications applications in excess of 1,000 feet. Moreover, due to its ability to support high bandwidth applications such as video and broadband internet applications, it is often a medium of choice for intra-campus and intra-building applications. Information is transmitted over optical networks by coded light impulses that travel through the glass fiber by the means of internal reflections. Once the information reaches its destination, the signals are converted to electric pulses and decoded. Fiber optic systems require supplementary equipment, including transceivers and network equipment to function properly.

- Wireless Technology

The most prevalent wireless options for interconnect are spread spectrum radio, GPRS, and microwave. Spread spectrum radio system operates by transmitting a signal over a wide range of frequency. Spread spectrum is an unlicensed bandwidth and operates with less than one-watt power transmission. Spectrum equipment is available in 900 MHz, 2.4 GHz, and 5.8 GHz frequency ranges. Additionally, the 4.9 GHz spectrum has been reserved for public safety applications. Spread spectrum equipment is relatively inexpensive and requires smaller antennas for transmission. Spread spectrum, like microwave, requires line of sight for data transmission and is subject to interference from other sources, including trees and vegetation. Typically, lower frequencies require less intense line of sight requirements and lower bandwidth. Higher frequencies offer higher bandwidths but are more sensitive to line of sight requirements. A field survey should be performed for each transmission path intended for use. Also, a frequency survey should be conducted over a multiday period to determine all possible interference sources. Lastly, over time, depending on the environment, the quality of spread spectrum communications may degrade if other unlicensed or licensed transmission sources use the same or similar communications bandwidths.

General Packet Radio Service (GPRS) uses the cellular network for data transmission. GPRS permits remote terminals to use the same frequency pair for transmitting and receiving data. Users of cellular network pay for the airtime and the costs may vary depending on usage.

Microwave communication is available in both licensed and unlicensed bandwidth. The licensed option requires an FCC license and unlicensed options currently operate in 23 MHz range. Microwave has the ability to transmit information point-to-point and requires a line of sight for proper data transmission. Microwave systems are generally more expensive than other wireless options and require a large dish-type antenna. Atmospheric factors, such as heavy rainfall or fog can create interference and reduce the power of signal transmission.

- Purchased Services

Purchased services are those telecommunications services that are available for purchase from telecommunications service providers. Typically, a one-time connection fee and a monthly fee are assessed for each location where the service is provided. These services are offered in a variety of

bandwidth and options starting with bandwidth as low as 56 kilobytes per second (the bandwidth of a standard home telephone line) to 50 megabytes per second and beyond. For the low bandwidth option, the connection can be an on demand option where the field device is dialed each time access is sought and the toll is only charged for the connection charge. These services are typically purchased from telephone or cable television companies. In addition to dial and continuous standard telephone connection, telephone companies tend to offer higher bandwidth (broadband) services including DSL, T-1 (1.5 megabytes per second) and T-3 (45 megabytes per second) lines. Cable television companies also offer broadband services that range from 300 kilobytes per second to 400 kilobytes per second to over 1 megabyte per second.

If parking facilities already have telecommunication services present, it may be possible to exchange information over a secure network connection. If considered, the exact method or protocol is typically determined during the design phase taking into account input from all stakeholders.

Table 8.2 outlines the advantages and disadvantages for various system connection types.

Table 8.2 – System Connection Types

Interconnect Medium	Advantages	Disadvantages
Fiber Optics	High bandwidth, provides capacity for future applications	Splice and connection costs
	Electrical transient and electrical surge resistant	Higher end electronic costs
Spread Spectrum	Lower cost	Subject to interference
	Versatile	
GPRS	Low initial cost	Airtime charges
		Unlicensed version subject to interference
Microwave	Lower cost for long transmission	Licensed version requires FCC approval
Purchased Services	Low initial cost	Monthly service fee

System Outputs

There are several technological options for conveying parking availability and status to visitors of downtown Durham, of which dynamic message signs along the roadway and on parking structures are common options. With the information infrastructure in place, pushing the parking information out to secondary sources such as GPS devices, Smartphones, and web pages also is an increasingly popular means of conveying parking availability information to users. The technology chosen for data collection and information display will have an impact on

the components needed at the control center, ultimately driving the conditions under which the system is operated as well as cost.

Recommended Improvements

Update Existing Parking Signage

There are a number of signs in poor condition, i.e. signs peeling or faded as seen in Figure 8.4. Other signs appear to have been modified or expanded after installation with an extra panel added beneath the original signage as seen in Figure 8.5. In some cases, the street signs within a district use the district's color, similar to the Central Park District signage shown in Figure 8.6. However, other signage is not consistent with district color coding, as shown in the black background signage in Figure 8.7. A comprehensive update to the downtown wayfinding and signage program is recommended to improve sign appearance and to ensure consistency of the district divisions and use of color codes in signage. Parking location elements should be incorporated into wayfinding signage, as appropriate, keeping the color distinction between districts intact. The inclusion of map kiosks at strategic pedestrian locations also will help to develop a well-rounded wayfinding system. An increase in sign reflectivity will enable their readability under nighttime conditions. In addition, adherence to the current local and State guidelines for sign size and reflectivity should be a requirement within the recommended wayfinding and signage program update. Incorporating these updates and modifications into the already existing wayfinding signage will support visitors in efficiently locating convenient parking and their final destination.



Figure 8.4 – Faded Wayfinding Signage



Figure 8.5 – Modified Wayfinding



Figure 8.6 – Color Coded Street Signs

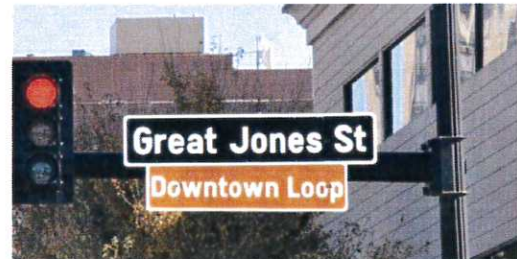


Figure 8.7 – Street Sign with Black Background

Implement Information Campaign

An initial review of popular restaurants and attractions in downtown Durham revealed a broad mix of how people are being directed to each destination. While most businesses provide an address that can be entered into an online mapping website or even provide a link that will take you to one, the majority of businesses do not indicate which district they are located. Most businesses provide general directions from major routes (or North, East, South, West) to their establishments and some list the most accessible parking locations. Knowing the district you are headed to will provide a sense of confidence in the driver as they approach downtown and begin seeing the wayfinding signing.

It is recommended that an information campaign be rolled-out that will provide maps, links, and language to each of the downtown businesses to use to promote the location of their business in relation to the downtown districts. This information can be incorporated into their websites, menus, pamphlets, or however they currently provide directions. Reaching each of the downtown visitors through this means will be an effective approach to expanding on the general understanding and use of the wayfinding program.

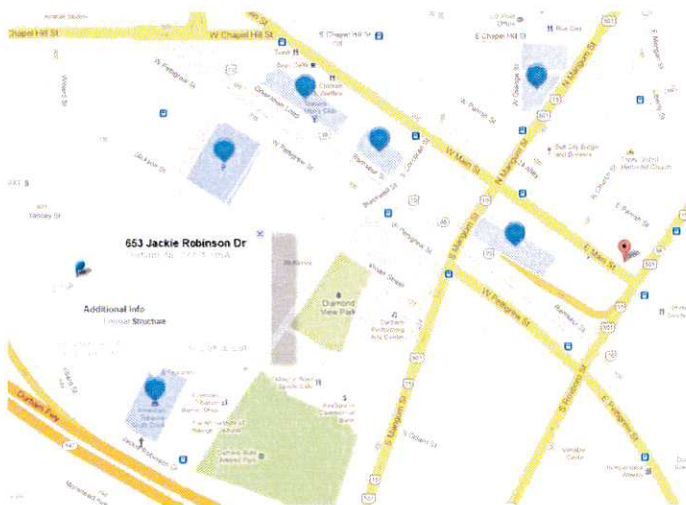
Augment Static Signage with Real-Time Parking Information

The provision of real-time parking information to motorists empowers them to make informed travel decisions which inherently improve traffic system performance, user satisfaction and the attractiveness of destinations. The business district in downtown Durham is complemented with cultural, sporting, and dining destinations, making it an attractive location for local citizens and visitors alike. Given the amount of commuter and visiting traffic within the area, it is recommended that the City provide real-time parking information for motorists.

While real-time parking information does require the deployment of field hardware, communications equipment, and central software, cost effective options are present within the marketplace and are being used by municipalities across the country. A variety of detection equipment, including non-intrusive ultrasonic sensors, video detection, or integration with parking revenue control systems are



PGS Signage



Mobile Application (from ParkMe website)

cost effective alternatives to inductive loops or space-by-space sensors. Wireless communications often provides an effective link between parking garage hardware, signs, and access points along City owned fiber optic cable routes. Usually, the installation of signs, cabling, and software development for web applications can present the highest costs in such a system.

Various levels of signage deployments are possible, including the use of dynamic directional signs along major corridors, dynamic space availability signs at garage locations, and dynamic level-by-level signs within garages. Given the size of garages in the downtown Durham area and the extensive costs of space-by-space systems the use of level by level or

space-by-space detection is not recommended for the City of Durham. These deployments are generally more efficient for massive parking structures found in airports or large shopping malls where wayfinding inside the parking garage is important. The City of Durham would benefit most from a system of dynamic parking availability signs complemented by static directional signs or from the use of dynamic parking availability signs, paired with static and dynamic directional signs. This signage can then be linked electronically to web-based applications that allow parking space availability information to be relayed via mobile device.

It also is recommended that the system be constructed in a way that parking calibration resets, integration components, and sign components are generally self-supported. This will alleviate the need to constantly monitor the system and perform daily maintenance, thus providing real-time information to travelers without requiring constant attention from the City or garage operators. The primary management agency for a parking guidance system will likely be the City of Durham Department of Transportation. Through application servers, the system will process all of the available parking information and distribute it appropriately. Any use of dynamic message signage along the roadways will be governed by City policies and procedures for developing and posting dynamic messages on City streets and by the North Carolina Department of Transportation on State routes. Typically, a parking guidance system will perform the following functions:

- Collect parking availability information
- Distribute the information to roadway and parking dynamic message signage as appropriate (signs on the street and/or signs at facility entrances)
- Notify the City and/or garage operator when certain conditions or thresholds are met (such as a facility at capacity and not accepting vehicles)
- Archive all parking data for future analysis

Typically, stakeholders that play a part in the operation and management of a parking guidance system will be parking facility owners and operators. Their function in the system operations is typically to maintain their facilities and the technology systems that will be delivering parking occupancy data to the operations center.

Depending on how data is received into the operations center, a parking guidance system server can perform a significant portion of the system automatically, thereby reducing the amount of personal interaction needed from a staff member. The operations center is typically staffed by City employees, knowledgeable in managing dynamic message signage unit, that manage traffic and help to coordinate roadway incidents. If the City were to incorporate dynamic message signage units for parking information communication, their use and management will likely become part of City staff everyday management operations.